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HIGH-FREQUENCY AUTOMATIC MEASURING LINE (USSR)

The Institute of Radiophysics and Electronics, Academy of Sciences USSR, has developed a shielded automatic measuring line for the 10-40-mc range. The line consists of a PR-1 cable 10 m in length wound on a 300-mm drum with a 30-mm pitch. Thirty electrical probes are placed at equal distances along the line; their output signals are detected and fed through a multi-contact mechanical switch rotating at 3 rev/sec and through an amplifier to a cathode-ray oscilloscope for observation of the standing wave. To decrease the noise caused by switching, the line is supplied with amplitude-modulated high-frequency energy so that the audio-frequency pulsed signals are fed to the switch. The optimum modulation frequency, which depends largely on the design of the switch, was found to be about 2000 cps; this frequency provides for 10 oscillations in each pulse. Experimental testing showed that the line may be successfully used in tuning wide-band multidipole antennas, transmission lines, matched directional couplers, and wide-band h-f transformers. Also, the line can be used in accurate tuning and matching of receiver input circuits with antennas for obtaining optimum signal-to-noise ratio. (Men', A.V., and I.N. Zhuk. Pribory i tekhnika eksperimenta, no. 1, 1961, 112-116) S/120/61/000/001

DEVICE FOR TESTING OF MATERIALS (EAST GERMANY)

A new ultrasonic "Sonovizor" which operates on the principle of pulse echo has been developed for nondestructive testing of materials. It is designed for study of the structural changes in metals, ceramics, and plastics, and is capable of detecting structural changes in steel billets 3 m thick. Chief advantage lies in the three-dimensional graphic presentation of test results. (Krasnaya zvezda, 17 May 1961, 4, cols. 2-3)

NEW OSCILLATOR (CZECHOSLOVAKIA)

Czech scientists have developed an electronic oscillator with a volume of 1.2 cm³ and weighing 2 g. It consumes one-tenth of the power required by its nonminaturized analog which weighs 200 g and has a volume of 850 cm³. (Krasnaya zvezda, 17 May 1961, 4, cols. 2-3)

PARAMAGNETIC RESONANCE OF Ti AND Co IONS IN CORUNDUM CRYSTALS (USSR)

A simple explanation is given for the unusual properties of Ti and Co ions in an Al_2O_3 crystal. In the case of Ti ions, there is a pronounced anisotropy of the g-factor, varying from 1.067 for the parallel to less than 0.1 for the perpendicular direction. The spin-lattice relaxation time increases from $5 \cdot 10^{-8}$ to 0.1 sec when the temperature drops from 9 to 1.55°K . It is assumed that the trigonal component of the crystalline field is much stronger than the spin-orbital interaction, and that the constant of the trigonal field is negative. Thus, the lower energy level is represented by the orbital doublet. The latter is split into two Kramers doublets, whereby the symmetry of the wave function of the lower doublet renders $g_1=0$. Its slight actual departure from zero is due to covalent bonds between the metal ion and the oxygen atoms. A suitable relationship between the cubic and trigonal field constants readily yields $g \approx 1.07$. The lengthening of the spin-lattice relaxation time of Co ions at helium temperatures is due to the extremely rapid decrease in the population of the upper Kramers doublet. At temperatures below that of liquid helium, when the magnetic field is 3000 oe, the relaxation time of Co ions is 560 times longer than that of Cr ions. (Al'tshuler, S.A., and M.M. Zaripov, Zhurnal eksperimental'noy i tekhnicheskoy fiziki, v. 40, no. 1, 1961, 377-379). S/056/61/040/001

POLYMERS AND COPOLYMERS OF VINYLPHOSPHONYL CHLORIDE (USSR)

Polymerization of vinylphosphonyl chloride and its copolymerization with styrene, methyl methacrylate, or vinyl acetate was carried out at the Institute of Organoelemental Compounds of the Academy of Sciences USSR in an attempt at modification of thermomechanical properties. It was found that the copolymers were not sufficiently stable and decomposed upon heating above 80°C . In dichloroethane they were swelling or even soluble. In dichloroethane solution the polymers could be hydrolyzed and insoluble copolymers of vinylphosphonic acid were formed. These hydrolyzed copolymers had higher softening points than corresponding carbon-chain polymers, a phenomenon attributed to the formation of a three-dimensional net of hydrogen bonds between the polymer molecules as a result of the presence of hydroxyls of vinyl phosphonic acid. Saponification of vinylphosphonyl chloride-vinyl acetate copolymers produced products soluble in water. (Rodionova, Ye. F., and G.S. Kolesnikov. Vysokomolekulyarnyye soyedineniya, v. 3, no. 3, 1961, 459-463). S/190/61/003/003

PHOSPHONITRILE CHLORIDE RUBBER (USSR)

The Moscow Institute of Chemical Technology imeni D.I. Mendeleyev has studied accelerated aging under the effect of heat and moisture of phosphonitrile chloride rubber ΦHK using the method of infrared spectroscopy and gravimetry. The aging of ΦHK rubber was shown to be caused by processes of structuration, degradation, and crystallization. Structuration is the result of the hydrolysis of the P-Cl bonds by the moisture of the air with the formation of P-O-P crosslinks. Degradation is the result of a destruction of the chains along the P=N bonds. Crystallization is a spontaneous process which takes place simultaneously with chemical aging and in which moisture has no effect. Hardened, crystallized ΦHK rubber can be "melted" if pressed in the hand for one minute; the melting point of the crystals is between 30 and 40°C. The chemical aging was shown to be a diffusion process begun on the surface of the rubber and connected with the adsorption of moisture. The effect of 40 individual stabilizers and fillers on the aging of ΦHK was studied. Complete stabilization could not be achieved with any of these substances. The best stabilizing effect was produced by 4.1% silicon rubber. (Zhivukhin, S.M., V.B. Tolstoguzov, and Yu.V. Meytin. *Vysokomolekulyarnyye soyedineniya*, v. 3, no. 3, Mar 1961, 414-419) S/190/61/003/003

MAGNESIUM ANODIZING (USSR)

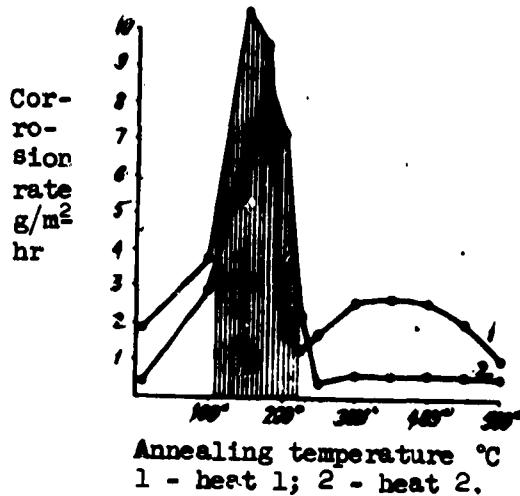
The Moscow Institute of Chemical Technology imeni D.I. Mendeleyev studied the structure of protective layers produced on magnesium by anodizing in a potassium fluoride electrolyte. X-ray diffraction patterns revealed that the protective layer generally contains MgF_2 and KMgF_3 . However, at a concentration of potassium fluoride below 100 g/l and at current densities below 1.5 a/dm² the layer contains magnesium fluoride only. This and other results of the experiments indicate that the formation of either compound is not an electrochemical process. Magnesium fluoride is apparently formed first; the KMgF_3 compound is a product of a solid-state reaction between magnesium fluoride and potassium fluoride. (Fedorova, N.S. *Izvestiya vysshikh uchebnykh zavedeniy. Khimiya i khimicheskaya tekhnologiya*, no. 6, 1960, 1067-1071) S/153/60/000/006

EFFECT OF HEAT TREATMENT ON CORROSION BEHAVIOR OF AMg6 ALUMINUM ALLOY AND WELDS (USSR)

The corrosion resistance of plates and welds of 2 heats of AMg6 aluminum alloy (6.2 and 6.5% magnesium, 0.70 and 0.59% manganese, 0.25 and 0.05% iron, 0.25 and 0.06% silicon, 0.14 and 0.10% titanium)

has been studied by the Institute of Electric Welding imeni Ye. O. Paton.

The welds were made by the TIG process and annealed for 10 hrs at 100—500°C. The corrosion tests were conducted in an aqueous solution of sodium chloride (31 g/l) and hydrochloric acid (25 g/l). It was found that annealing of the base plate at 125—225°C brings about a sharp increase in corrosion rates (see illustration) and in susceptibility to intergranular corrosion. The



weld metal and the weld-adjacent zone of the base plate, heated during welding to 100—500°C, possessed high corrosion resistance regardless of the temperature of initial annealing. Microscopic examination revealed that prolonged annealing at 125—225°C results in precipitation of a secondary phase on the grain boundaries of the aluminum-magnesium solid solution. The fact that this secondary phase has a higher negative potential than the solid solution leads to intensive intergranular corrosion. (Rabkin, D. M., L. N. Yagupol'skaya, A. V. Nikitina, and V. F. Grabin. Avtomaticheskaya svarka, no. 2, Feb 1961, 40-48) S/125/61/000/002

CONTINUOUS ACTION VISCOSIMETER (USSR)

The design and performance is described of a continuous-action viscosimeter, which is based on the principle that viscosity is determined by measuring the attenuation of natural oscillations of a magnetostrictive probe immersed in the liquid. The new viscosimeter permits automatic, continuous, and remote measurement of the viscosity of liquids both at rest and during flow. (Kogin, I.N., F.B. Vurzel', V.V. Rubinshteyn, and A.V. May. Plasticheskiye massy, no. 3, 1961, 49-53) S/191/61/000/003

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